Test Report

Prepared for: Sierzega Elektronik GmbH

Model: GRM-V22

Serial Number: 35082, 35226

Project No: p2440003

Test Results: Compliant

To

FCC Part 1.1310 / 2.1091
and
RSS-102: Issue 5 (March 2015)

Date of Issue: August 1, 2024

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Reviewed / Authorized By:

Jeremiah Darden, Principal Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	June 28, 2024	Jeremiah Darden	Original Document
2.0	August 1, 2024	Jeremiah Darden	Fixed frequency range in MPE summation table, add IC numbers to EUT description, added power and formulas to RF exposure summation table

Current revision of the test report replaces any prior versions. Only the current version of the test report is valid.

EUT Description

Model:	**GRM-V22**
Serial:	**35082, 35226**
Firmware:	**V9.6**
Software:	**N/A**
Description:	**Module for monitoring Vehicle Traffic Speed on Roadways**
Additional Information:	**Calculations in this report are based on measured values from the respective FCC 15.245 and RSS-210 Reports for the Radar and the Co-Located Radio information pull acquired from the FCC website. RF exposure based on radiated measurements** **EUT operates at 12VDC.** **Usage: Table/Desktop (Mounted at installation)** **Radar 24GHz:** **FCC ID: S6P-GRM-V22** **IC: 5792A-GRMV22** **Co-Located Radio:** **Contains FCC and IC ID's:** **BLE: QOQ-GM220P / 5123A-GM220P** **Cellular: XMR201910BG95M3 / 10224A-2019BG95M3**

MPE Evaluation (FCC)

This is a mobile device used in Uncontrolled Exposure environment.

Limits Controlled Exposure 47 CFR 1.1310 Table 1, (A)	0.3-3.0 MHz:	Limit [mW/cm²] = 100
	3.0-30 MHz:	Limit [mW/cm²] = (900/f²)
	30-300 MHz:	Limit [mW/cm²] = 1.0
	300-1500 MHz:	Limit [mW/cm²] = f/300
	1500-100,000 MHz	Limit [mW/cm²] = 5

Limits Uncontrolled Exposure 47 CFR 1.1310 Table 1, (B)	0.3-1.234 MHz:	Limit [mW/cm²] = 100
	1.34-30 MHz:	Limit [mW/cm²] = (180/f²)
	30-300 MHz:	Limit [mW/cm²] = 0.2
	300-1500 MHz:	Limit [mW/cm²] = f/1500
	1500-100,000 MHz	Limit [mW/cm²] = 1.0

Test Data

Test Frequency, MHz	24,075 – 24,175
Peak Power, Radiated, V/m (E)	11.88
Antenna Type	The radar uses two identically designed antennas for Rx and TX. Each 4x4 patch, 17.1dBi
Distance (R)	21 cm

$S = \frac{P * G}{4\pi r^2}$
$S = \frac{E^2}{Z,FS} * .1$
Power Density (S) mW/cm²
0.037 mW/cm²

Note: Conversions are based on free space conditions (impedance of 377 ohm)

Power Density (S) =
Limit = (from above table) = 1 mW/cm²

MPE Evaluation (RSS 102)

RF Exemption Section 2.5

EIRP Calculations

Frequency (MHz)	Radiated Power (dBuV/m@3m)	Duty Cycle (%)	Time Averaged Radiated Power (dBuV/m@3m)	EIRP (dBm)	EIRP (W)	Exemption Limit (W)
24,075-24,175	118.4	100	118.4	23.17	.208	5

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

• below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

• at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 22.48/f0.5W (adjusted for tune-up tolerance), where f is in MHz;

• at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);

• at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 f0.6834 W (adjusted for tune-up tolerance), where f is in MHz;

• at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

The SAR measurement is not necessary.
RSS 102 Annex C has been submitted with this Technical Brief, which shows compliance to the RF Exposure Limits in RSS 102.

FCC 47 CFR 1.1307(b)(3)(ii)(B) for multiple RF sources operating in the same time-averaging period.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Where:

***a** = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for P_{th}, including existing exempt transmitters and those being added.*
***b** = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.*
***c** = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.*
***P_i** = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).*
***$P_{th,i}$** = the exemption threshold power (P_{th}) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.*
***ERP_j** = the ERP of fixed, mobile, or portable RF source j.*
***$ERP_{th,j}$** = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.*
***Evaluated$_k$** = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.*
***Exposure Limit$_k$** = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from § 1.1310 of this chapter.*

All power density calculations are based on one of the following formulas. Power for BTLE and Cellular are taken from the respective reports on the FCC website.

$S\ (mW/cm^2) = \frac{P * G}{4\pi r^2}$
$S\ (mW/cm^2 = \frac{E^2}{Z,FS} * .1$

Radio	Frequency (MHz)	Max. Av Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Ratio
BTLE	2402-2483.5	8.82	1.86	21	0.002	1	0.002

Radio	Frequency (MHz)	PG (mW)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Ratio
Cellular	GSM850	2845.116	21	0.513	.566	.906

Radio	Frequency (MHz)	Duty Cycle	Electric Field Strength (V/m)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Ratio
FSK Radar	24,075 – 24,175	100	11.88	21	0.037	1	.037

Sum of Maximum Ratios	Limit	Compliant
0.947	1	Compliant

END OF TEST REPORT